WHAT IS CLAIMED IS:

1. A fabrication method of an ultra-fine TiC-base cermet alloy with a homogenous solid solution grain structure comprising the steps of:

forming powder mixture of TiC 50-90wt% (weight percentage), TMxCy (where x and y are integers) 5-30 wt% and Ni or Co or a mixture of Ni and Co 5-30wt% from mixing titanium (Ti) powder, transition metal (TM) powder, carbon (C) powder, nickel (Ni) powder and cobalt (Co) powder;

synthesizing a nano-composite powder of (Ti, TM)C-(Ni, Co) through a high energy ball-milling of previously said powder mixture by putting into a milling jar together with balls with a fixed diameter; and

compacting and sintering said synthesized composite powder.

2. The method as claimed in Claim **1**, wherein said Ti powder, transition metal powder, carbon powder, Ni powder and Co powder have a purity value above 95% and their diameter size is less than 1 mm.

3. The method as claimed in Claim **1**, wherein the basic

material for said milling jar and the balls is at least one material selected from the group consisting of tool steel, stainless steel, WC-Co hard metal, silicon nitride, alumina, and Zirconia.

4. The method as claimed in Claim **1**, wherein said transition metal is at least one metal element selected from the group consisting of molybdenum (Mo), tungsten (W), niobium (Nb), vanadium (V) and chromium (Cr).

5. The method as claimed in Claim **1**, wherein the diameters of said balls are in a range between 5 and 30 mm and the weight ratio between the balls, which is put into the milling jar, and the powder mixture is in a range between 1:1 and 1:100.

6. The method as claimed in Claim **1**, further including a step of measuring the surface temperature of the milling jar using a non-contact type infrared thermometer during said high energy ball milling process.

7. The method as claimed in Claim **1**, further including a step of continuing said ball milling process for 1

to 20 hours if a sharp rise in temperature on the surface of the milling jar is detected.

8. The method as claimed in Claim **1**, wherein said high energy ball milling process is implemented using a shaker mill, vibration mill, planetary mill or attritor mill.

9. The method as claimed in Claim **1**, wherein said high energy ball-milling process is implemented after charging argon gas into the milling jar.

10. The method as claimed in Claim **1**, wherein said sintering is carried out under a 10^{-2} torr vacuum condition or under an argon environment in a temperature range between 1300 and 1500°C for a duration of 1 to 4 hours.

11. The method as claimed in Claim **6**, wherein said high energy ball milling process is implemented using a shaker mill, vibration mill, planetary mill or attritor mill.

12. The method as claimed in Claim **7**, wherein said high energy ball milling process is implemented using

a shaker mill, vibration mill, planetary mill or attritor mill.

13. The method as claimed in Claim **6**, wherein said high energy ball-milling process is implemented after charging argon gas into the milling jar.

14. The method as claimed in Claim **7**, wherein said high energy ball-milling process is implemented after charging argon gas into the milling jar.